149. (New) The imaging device according to claim 139, wherein said nitrogen containing insulating layer is disposed only over either said transfer gate stack or said reset gate stack.

REMARKS

The application has been carefully reviewed in light of the Office Action dated October 3, 2000, rejecting claims 1-4, 7-15, 18-23, 25-29, 31-39, 41-63, 65, 66, 115-129. Claim 66 has been amended, and claims 130-149 have been added. Claims 1-4, 7-15, 18-23, 25-29, 31-39, 41-63, 65, 66, 115-149 are now pending in this application.

New claims 130-149 are directed to additional embodiments of the present invention. Support for claims 130-134 is taken from the specification, page 17, lines 22-30, page 18 lines 1-2, and associated Figures 9 and 10. Support for claims 135-149 is taken from the specification, page 15 lines 25-30, and associated figures 5-9. Entry of the foregoing amendment and new claims is respectfully requested.

Claim 66 stands rejected under 35 U.S.C. §112, first paragraph, because the "processor" for use in a "camera" system component is unclear from the specification. Claim 66 has been amended to recite "wherein said system is a camera." Claim 66 is believed to be in full compliance with 35 U.S.C. §112, first paragraph.

Claims 1-3, 7, 12, 14, 15, 18, 19, 25, 26, 28, 29, 31-33, 38, 39, 41-44, 46, 51, 53-55, 57-59, 66, 115-119 stand rejected under 35 U.S.C. §103 as unpatentable over the acknowledged prior art in this application (Figures 1, 2, pages 1-12) and Nagasaki et al., considered together. This rejection is respectfully traversed.

Claim 1 recites an imaging device comprising a "nitrogen containing insulating layer over said substrate and beneath said photogate." Nagasaki discloses and claims a solid-state imaging device containing an insulating film made of "a high dielectric material having a high relative dielectric constant." (Column 11, lines 20-22). The Examiner suggests that from Nagasaki (Figure 17; columns 2-3) it would have been obvious to use an insulator with a higher dielectric constant in order to increase the capacity of the photogate.

However, while Nagasaki teaches the use of a high dielectric material, it also specifically teaches that silicon oxide and silicone nitride are low dielectric constant materials, while antiferroelectrics and ferroelectrics are high dielectric materials. (Column 3; lines 20-28). Nagasaki then proceeds to unequivocally and repeatedly exclude the use of low dielectric materials, including silicone oxide and silicone nitride, in its invention. (Column 4, line 57; column 5, line 42; column 6, line 33; column 6, lines 57-59; etc.)

The Examiner is again urged to consider that the Nagasaki reference teaches away from the present invention. It is well settled that a prior art reference must be considered in its entirety, including portions that would lead away from the claimed invention. *W. L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984). As discussed above, it cannot be argued that Nagasaki teaches *not* to use a nitrogen containing insulating material. The present invention, on the other hand, teaches and claims the use of a nitrogen containing insulating material.

The Applicants submit that the Examiner has not established the requisite *prima facie* elements for obviousness as set out in MPEP §2142. Specifically, MPEP §2142 requires that there must be a reasonable expectation of success when combining references. As established above, Nagasaki clearly teaches away from using nitrogen containing insulating materials. Therefore, it is not plausible to suggest that one of ordinary skill in the art would have used a nitrogen containing material in place of a silicon oxide.

Further, MPEP §2142 requires some suggestion of motivation, and, when the motivation is not apparent, as is the case here, it is the duty of the examiner to explain why the combination of the teachings is proper. *Ex Parte Skinner*, 2 USPQ2d 1383 (Bd. Pat. App. & Inter. 1986). The Examiner's sole suggestion of motivation in this case is that it would have been obvious to one ordinarily skilled in the art to use an insulator with a higher dielectric constant to increase the capacity of the photogate. No reference is cited which suggests the use of a nitrogen containing insulating layer in the location claimed. Nagasaki does not teach or suggest that a nitrogen containing insulating layer would be useful for any purpose in the location claimed, much less to achieve the improved signal acquisition, wider dynamic range, and improved signal to noise ratio discussed, for example, at page 13, lines 10-20 and page 18, lines 20-24 of the application.

For at least the forgoing reasons Nagasaki combined with the prior art acknowledged in this application does not render claim 1 obvious under 35 U.S.C. §103. Applicants respectfully submit that claim 1 is allowable over the cited references.

Claims 2, 3, 7, 12, and 115 are dependent upon claim 1, and contain all the limitations of claim 1. Claims 2, 3, 7, 12, and 115 are believed to be in immediate

condition for allowance for those reasons outlined above for the allowance of claim 1, and also because the unique combinations recited in these dependent claims are neither taught nor suggested by the cited references.

Claim 14 recites an "imaging device including a semiconductor integrated circuit substrate ... comprising ... a nitrogen containing insulating material formed over [a] substrate and beneath [a] photogate." Applicants submit that claim 14 is allowable for the same reasons outlined above for allowance of claim 1.

Claims 15, 18, 19, 25, 26, and 116 are dependent upon claim 14, and contain all the limitations of claim 14. Claims 15, 18, 19, 25, 26, and 116 are believed to be in immediate condition for allowance for those reasons outlined above for the allowance of claim 14, and also because the unique combinations recited in these dependent claims are neither taught nor suggested by the cited references.

Claim 28 recites "an imaging system comprising ... wherein a nitrogen containing insulating layer is formed over [a] substrate and beneath [a] photogate." Applicants submit that claim 28 is allowable for the same reasons outlined above for allowance of claim 1.

Claims 29, 31-33, 38, and 117 are dependent upon claim 28, and contain all the limitations of claim 28. Claims 29, 31-33, 38, and 117 are believed to be in immediate condition for allowance for those reasons outlined above for the allowance of claim 28, and also because the unique combinations recited in these dependent claims are neither taught nor suggested by the cited references.

Claim 39 recites "an imaging system ... wherein a nitrogen containing insulating layer is formed over [a] substrate and beneath [a] photogate." Applicants submit that claim 39 is allowable for the same reasons outlined above for allowance of claim 1.

Claims 41-44, 46, 51, and 118 are dependent upon claim 39, and contain all the limitations of claim 39. Claims 41-44, 46, 51, and 118 are believed to be in immediate condition for allowance for those reasons outlined above for the allowance of claim 39, and also because the unique combinations recited in these dependent claims are neither taught nor suggested by the cited references.

Claim 53 recites a "system comprising ... a CMOS imaging device ... including ... a nitrogen containing insulating layer over [a] substrate and beneath [a] photogate." Applicants submit that claim 53 is allowable for the same reasons outlined above for allowance of claim 1.

Claims 54-55, 57-59, and 119 are dependent upon claim 53, and contain all the limitations of claim 53. Claims 54-55, 57-59, and 119 are believed to be in immediate condition for allowance for those reasons outlined above for the allowance of claim 53, and also because the unique combinations recited in these dependent claims are neither taught nor suggested by the cited references.

Claims 4, 27, 45, 56, and 120-129 stand rejected under 35 U.S.C. §103 as unpatentable over the acknowledged prior art in this application (Figures 1, 2, pages 1-12) and Nagasaki as applied in the above rejection, further considered together with Koike et al. The Office Action relies on Koike, column 3, for disclosing an electrode that permits

light to permeate to a diode surface. Additionally, the Office Action relies on Figure 2 of Koike which shows a "gate electrode" 18 beneath a "second oxide film" 21. This rejection is respectfully traversed.

This applicants submit that Koike does nothing to remedy the deficiency associated with Nagasaki as discussed above. Independent claims underlying dependent claims 4, 27, 45, 56, and 120-129 recite a nitrogen containing insulating layer over a substrate and beneath a photogate. Koike does not teach a nitrogen containing insulating layer. For this reason alone, claims 4, 27, 45, 56, and 120-129 are allowable over the prior art.

Additionally, claims 4, 27, 45, 56 recite a "semi-transparent conductor ... selected from the group consisting of indium-tin-oxide, tin oxide, indium oxide and doped hydrogenated amorphous silicon." Koike in column 3 discloses "a material permitting light to permeate ... made of SnO_2 [tin-dioxide] or InO_2 [indium-dioxide] or a semi-transparent electrode made of polycrystalline silicon." Therefore, Koike does not disclose the use of indium-tin-oxide, tin-oxide, indium oxide or doped hydrogenated amorphous silicon.

Further, because Koike does not remedy Nagasaki's problem concerning the unique use of silicon nitride or other nitrogen containing insulating material, it cannot be construed as also teaching any of the structural configurations set forth in claims 120-129. Claims 120-129 recite a "gate stack over [a] substrate and beneath [a nitrogen containing] insulating layer." Nagasaki does not teach an insulating layer over any structure that can be

comparable to a gate stack. For at least the foregoing reasons, claims 4, 27, 45, 56, and 120-129 are allowable over the prior art.

Claims 8, 10, 11, 20, 22, 23, 34, 36, 37, 47, 49, 50, 60, 62 and 63 stand rejected under 35 U.S.C. §103 as unpatentable over the acknowledged prior art in this application (Figures 1, 2, pages 1-12) and Nagasaki as applied in the above rejection, further considered together with Suzuki. The Office Action relies on Suzuki, column 4, for the proposition that "the claimed materials (NO or ON) ... are well known to have a higher dielectric constant then silicon oxide, ... which would have been obvious to use ... to achieve a higher capacity for the photogate." This rejection is respectfully traversed.

The applicants submit that Suzuki does nothing to remedy the deficiency associated with Nagasaki as discussed above. Independent claims underlying dependent claims 8, 10, 11, 20, 22, 23, 34, 36, 37, 47, 49, 50, 60, 62 and 63 recite a nitrogen containing insulating layer over a substrate and beneath a photogate. Suzuki does not teach the use of a nitrogen containing insulating layer at the location claimed as opposed to a silicon oxide layer. For this reason alone, claims 8, 10, 11, 20, 22, 23, 34, 36, 37, 47, 49, 50, 60, 62 and 63 are allowable over the prior art.

Claims 8, 9, 13, 20, 21, 34, 35, 47, 48, 52, 60, 61 and 65 stand rejected under 35 U.S.C. §103 as unpatentable over the acknowledged prior art in this application (Figures 1, 2, pages 1-12) and Nagasaki as applied in the above rejection, further considered together with Okada et al. The Office Action relies on Okada for the proposition that the "material ONO ... is well known to have a higher dielectric constant

than silicon oxide, ... which would have been obvious to use ... in order to achieve a higher capacity for the photogate." This rejection is respectfully traversed.

The applicants submit that Okada does nothing to remedy the deficiency associated with Nagasaki. Even if Okada teaches ONO, Okada does not teach or suggest its use as claimed. Independent claims underlying dependent claims 8, 9, 13, 20, 21, 34, 35, 47, 48, 52, 60, 61 and 65 recite a nitrogen containing insulating layer over a substrate and beneath a photogate. Okada does not teach a nitrogen containing insulating layer. For this reason alone, claims 8, 9, 13, 20, 21, 34, 35, 47, 48, 52, 60, 61 and 65 are allowable over the prior art.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue.

Dated: January 3, 2001

Respectfully submitted,

By_____

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